

ORGANIC: CHEMISTRY OF BIOMOLECULES**THEORY****Unit I: Amino acids, Peptides and Proteins**

Amino acids: Classification, relative and absolute configuration.

Synthesis of α -Amino acids: Phthalimide synthesis, Strecker synthesis, phthalimidomalonic ester synthesis and azalactone synthesis.

Ionic properties and reactions: Zwitter ions, pKa values, isoelectric point, application of electrophoresis (gel and paper) and ion exchange chromatography in separation and purification of amino acids and proteins.

Peptides: Peptide linkage, determination of their primary structures, end group analysis (Edmans, Sanger's and Dansyl chloride method only), application of partial hydrolysis (chemical, enzymatic). Peptide synthesis: using N-protecting groups (Boc and benzyloxycarbonyl methods only), C-protecting group, C-activating groups (acid chloride, acid azide, activated esters and DCC methods only) and Solid-phase synthesis.

Proteins: classification, tests in laboratory and biological importance, primary, secondary (α -helix and β -pleated sheets), tertiary and quaternary structures of proteins.

Unit II: Enzymes

Introduction, classification and characteristics of enzymes. Salient features of active site of enzymes.

Mechanism of enzyme action (taking trypsin as example), factors affecting enzyme action, coenzymes and cofactors and their role in biological reactions, specificity of enzyme action (including stereospecificity), enzyme inhibitors and their importance, phenomenon of inhibition (competitive, uncompetitive and non-competitive inhibition including allosteric inhibition).

Unit III: Lipids

Lipids: Introduction and classification.

Oils and fats : Common fatty acids present in oils and fats, essential fatty acids and their importance, omega fatty acids, trans fats, hydrogenation, saponification value, iodine number, acid number, drying, rancidity (hydrolytic and oxidative) and reversion.

Biological importance of triglycerides, phospholipids, glycolipids, sphingolipids and steroids (cholesterol). Liposomes and their biomedical applications.

Unit IV: Nucleic Acids

Components of nucleic acids: Nitrogenous bases (adenine, guanine, thymine, uracil and cytosine), sugar and phosphate; nucleosides, nucleotides and their nomenclature; Phosphodiester linkage and structure of polynucleotides; structure of DNA (Watson-Crick model) and RNA (types of RNA), genetic code.

Biological roles of DNA and RNA: Introduction to replication, transcription and translation.

Unit V: Concept of Energy in Biosystems

Cells obtain energy by the oxidation of foodstuff (organic molecules).

Introduction to metabolism (catabolism, anabolism).

ATP: The universal currency of cellular energy, ATP hydrolysis and free energy change. Agents for transfer of electrons in biological redox systems: NAD^+ , FAD.

Conversion of food to energy: Outline of catabolic pathways of carbohydrate- glycolysis, fermentation, Krebs cycle.

Overview of catabolic pathways of fat and protein.

Interrelationship in the metabolic pathways of protein, fat and carbohydrate.

Caloric value of food, standard caloric content of food types.

Recommended Texts:

1. Morrison, Robert Thornton & Boyd, Robert Neilson *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Sixth Edition, 2003.
2. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Sixth Edition, 2003.
3. Finar, I. L. *Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Fifth Edition, 1975.
4. Graham Solomons, T.W., Craig B. Fryhle *Organic Chemistry*, Ninth edition John Wiley & Sons, Inc. 2008.
5. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; *Organic Chemistry*, Oxford University Press, First Edition, 2001.
6. Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry*, Fifth Edition, 2010., W. H. Freeman.
7. Berg, J. M.; Tymoczko, J. L. & Stryer, L. *Biochemistry*, Seventh Edition, 2012., W. H. Freeman.

PRACTICAL

ORGANIC: ISOLATION AND ESTIMATION OF SELECTED BIOMOLECULES AND PREPARATION OF ORGANIC COMPOUNDS

1. Estimation of phenol and aniline by bromination with potassium bromated-potassium bromide method.
2. Estimation of glycine by Sorenson's formalin method.
3. Study of the titration curve of glycine.
4. Estimation of proteins by Lowry's method.
5. Study of the action of salivary amylase on starch at optimum conditions.
6. Effect of temperature on the action of salivary amylase.
7. Saponification value of an oil or a fat.
8. Determination of Iodine number of an oil/fat.
9. Isolation and characterization of DNA from onion/cauliflower/peas.

Recommended Texts:

1. Manual of Biochemistry Workshop, 2012, Department of Chemistry, University of Delhi.
2. Arthur, I. V. *Quantitative, Organic, Analysis* s Pearson.
3. Cooper, T.G. *The Tools of Biochemistry*, John Wiley and Sons, N.Y. USA. 16 (1977).